Investigating the Phytochemical, Antibacterial and Antifungal Effects of *Thymus Vulgaris* and *Cuminum Cyminum* Essential Oils

Soghra Valizadeh (MSc)
Department of Food Hygiene& Quality Control, Faculty of Veterinary Medicine, Urmia University, Urmia, Iran

Razzagh Mahmoudi (PhD)
Department of Health and Food Safety, School of Public Health, Qazvin University of Medical Sciences, Qazvin, Iran

Tayebeh Fakheri (DVM)
Faculty of Veterinary Medicine, University of Tabriz, Tabriz, Iran

Farzad Katiraee (PhD)
Department of Pathobiology, Faculty of Veterinary Medicine, University of Tabriz, Tabriz, Iran

Vahideh Rahmani (DVM)
Department of Clinical Sciences, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran

Corresponding author: Razzagh Mahmoudi

E-mail: r.mahmodi@yahoo.com

Tell: 09127868571

Address: Department of Health and Food Safety, School of Public Health, Qazvin University of Medical Sciences, Qazvin, Iran

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Abstract

Background and Objective: The aim of this study was to determine the chemical composition, antibacterial and antifungal effects of *Thymus vulgaris* and *Cuminum Cyminum* essential oils against foodborne pathogens and Candida species in vitro.

Methods: The essential oils were extracted from the aerial parts of *Thymus vulgaris* and dried *Cuminum Cyminum* seeds using a Clevenger apparatus for 3 hours. Analysis of the essential oils' constituents was performed using gas chromatography-mass spectrophotometry. The antibacterial activity of *Cuminum Cyminum* essential oil and essential oil of *Thymus vulgaris* against *Bacillus cereus, Listeria monocytogenes, Escherichia coli* and *Salmonella typhimurium* were evaluated in agar culture medium. The minimum inhibitory concentration (MIC) of these essential oils against fungal strains of *Candida albicans, C. tropicalis, C. parapsilosis* and *C. dubliniensis* was measured.

Results: Thymol (64.45%) and cuminaldehyde (29.02%) were the main components of the essential oil of *Thymus vulgaris* and *Cuminum Cyminum*, respectively. The largest inhibition zone diameter in the essential oils of *Thymus vulgaris* and *Cuminum Cyminum* in the agar disk diffusion method was related to *B. cereus* with 30 and 21 mm diameter, respectively. The largest growth inhibition zone diameter by the essential oil of *Thymus vulgaris* in the well diffusion method was 21 mm and against *B. cereus.* The MIC of essential oil of *Thymus vulgaris* in the microdilution method was 0.09% against all the four *Candida* strains. The MIC of *Cuminum Cyminum* essential oil against strains of *C. albicans* and *C. tropicalis* was 0.39%, while it was found as 0.19% against *C. parapsilosis* and *C. dubliniensis*.

Conclusion: In this study, *Cuminum Cyminum* essential oil and essential oil of *Thymus vulgaris* show suitable inhibitory effects against the growth of bacteria using well and disk diffusion methods. Regarding the antifungal effects, the MIC of essential oil of *Thymus vulgaris* is lower than the *Cuminum Cyminum* essential oil, which indicates the higher antifungal activity of the essential oil of *Thymus vulgaris*. This study has raised the possibility of using these essential oils as suitable antimicrobial compounds and alternatives for chemical preservatives in the food industry.

Keywords: essential oil, Cuminum cyminum, Thymus vulgaris, antibacterial, antifungal.

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